Chapter 11
Maintenance of Thermal Spray Coatings

11-1. Introduction

Thermal spray coatings are very durable and long-lived. However, thermal spray coatings may suffer damage and will eventually degrade in service and, therefore, may require maintenance or repair. The American National Standards Institute (ANSI) and the American Welding Society (AWS) have published a standard for repair and maintenance of thermal spray coatings.

11-2. Assessing the Condition of Thermal Spray Coatings

The first step in the repair of thermal spray coatings is an assessment of the type of thermal spray system and the nature of the damage or wear. The type of thermal spray material originally applied must be determined. If a sealer and paint topcoat are present, they must also be identified. Historic records are the easiest means of making these determinations. Chemical analyses may also be used, but this can be time consuming and expensive. The experienced observer may also be able to distinguish between the various types of thermal spray materials. The type and extent of degradation should be observed and noted. A worn coating is indicated by general or localized thickness reductions. Coating oxidation will be evident by the presence of a powdery residue on the coating surface. The presence of rust and bare steel should be noted. Cracked, blistered, and delaminated areas should be identified. The extent and location of the damage or wear should be determined.

11-3. Repair Procedures

The thermal spray coating repair procedures used depend on the type and extent of degradation and the presence or absence of sealer and paint topcoat. ANSI/AWS C2.18-93 “Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites” addresses the maintenance and repair of thermal spray coatings. This section summarizes the types of repair procedures available. Paragraph 11-4 discusses when and in what combinations these procedures should be used.

a. Solvent clean. Grease and oil should be removed by solvent cleaning using ASTM D 3734 “High-Flash Aromatic Naphthas, Type I.” The solvent may be applied by wiping, brushing, or spraying.

b. Scrape with flexible blade. A small (25-mm (1-in.)) flexible blade scaper is used to remove loose paint and thermal spray coating near the damaged or worn coating.

c. Scrape with hard blade. A hard blade scraper is worked underneath the coating to remove loosely adherent paint and thermal spray.

d. Brush clean by hand. A stiff stainless steel or bristle brush is used to remove loose debris by hand brushing.

e. Abrasive brush blast clean. Fine mesh (30 - 60) angular iron oxide grit or aluminum oxide is used to remove loose paint and thermal spray coating. The blasting must be done using a relatively low nozzle pressure (about 340 kPa (50 psi)) so that only loose materials are removed and an anchor profile is created.

f. Power tool clean. Hand-held power tools including disc sanders and rotary brushes should be used with light pressure to clean and roughen the surface. Care should be taken not to polish the surface.

g. Abrasive blast clean to SSPC-SP 10/NACE #2 "Near White Metal." The surface is cleaned and profiled using abrasive blast cleaning equipment. The blast nozzle must be worked perpendicular to the surface to prevent removal of intact thermal spray adjacent to the cleanup area.

h. Feather edges. A 50- to 75-mm (2- to 3-in.) feathered or tapered border is created around the repaired areas.

i. Light abrasion. The cleaned and feathered areas are lightly abraded using sandpaper to improve the adhesion of subsequent sealer and paint coats.

j. Apply thermal spray coating. The thermal spray repair metal should be the same as that originally applied. Flame sprayed coatings should not be topcoated using arc spray equipment. Arc sprayed coatings may be repaired using either arc or flame spray.

k. Seal and topcoat. Sealer and topcoat materials are applied as the final step of the repair sequence.

11-4. Repair Sequences

a. Increasing thermal spray coating thickness. Unsealed thermal spray coatings that are worn thin or that were applied to less than the specified thickness may be repaired by preparing the surface and applying more metal. If the coating was recently applied, it may be possible to simply apply additional coating directly onto the original coating. If the coating is oxidized, the abrasive brush blast procedure should be used prior to application of additional thermal spray coating material.

b. Repair of small damaged areas with steel substrate not exposed. Small damaged areas ($< 0.1\ m^2$ ($<1\ ft^2$)) where the steel substrate is not exposed are repaired by solvent cleaning, scraping with a flexible blade tool, wire brushing, edge feathering, lightly sanding to abrade the cleaned areas, and sealing and painting.

c. Repair of large damaged areas with steel substrate not exposed. Large damaged areas ($> 0.1\ m^2$ ($>1\ ft^2$)) where the steel substrate is not exposed are repaired by solvent cleaning, abrasive brush blasting, edge feathering, and sealing and painting.

d. Repair of thermal spray coatings with steel substrate exposed. Either of two procedures may be used to repair thermal spray coatings damaged to the extent that the steel substrate is exposed. One method uses a rapid "paint only" repair procedure and the other utilizes thermal spray coating plus sealer and paint coats.

(1) The rapid paint repair procedure includes solvent cleaning, scraping with a hard blade tool, power tool cleaning, edge feathering, and sealing and painting.

(2) The thermal spray repair procedure includes solvent cleaning, scraping with a hard blade tool, abrasive blast cleaning to near white metal, edge feathering, thermal spray coating application, and sealing and painting.